SEMICONDUCTOR DEVICE

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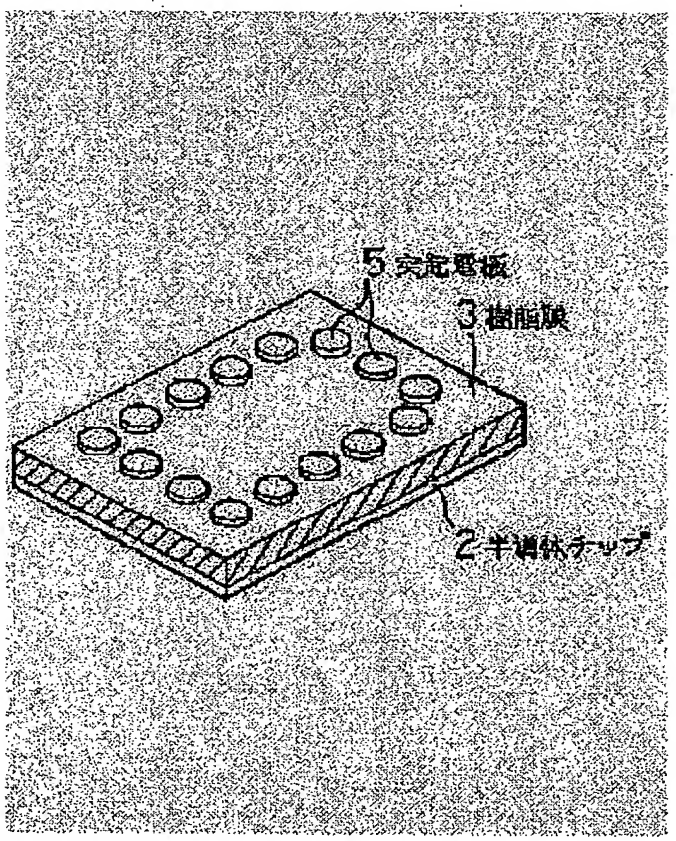
Abstract of **JP5055278**

PURPOSE:To improve handling operability of a semiconductor chip in a manufacturing step while reducing in thickness of the chip itself irrespective of the size of a semiconductor wafer and to obtain a small-sized thin semiconductor device. CONSTITUTION:A semiconductor wafer 1 is reduced in thickness while forming a resin film 3 in a protective reinforcing plate, protrusion electrodes 5 protrude from the film 3 on a semiconductor chip 2 as an external connection terminal, and the film 3 is so cut as to be the same in size as the chip 2. Thus, a semiconductor device having high reliability, easy handling, small size and thickness, is obtained.



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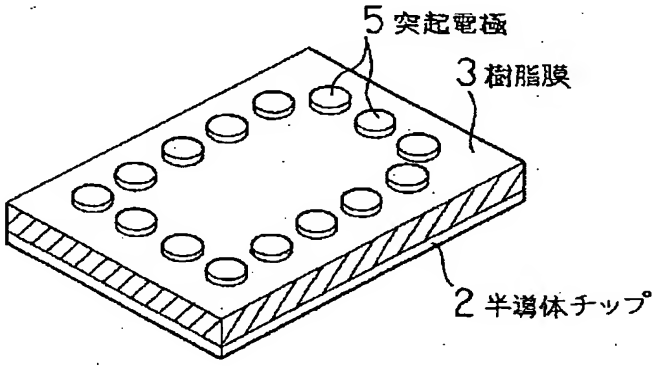
(54)【発明の名称】　半導体装置

(57)【要約】

【目的】半導体チップそのものの厚みを半導体ウエハの大きさによらず薄くさせながら、製造工程における半導体チップの取り扱い作業性を向上させ、かつ、小型、薄型の半導体装置を得る。

【構成】樹脂膜3を保護強化板としながら半導体ウエハ1を薄くし、かつ、半導体チップ2上の樹脂膜3から突起電極5を突出させて外部接続端子とし、樹脂膜3の大きさを半導体チップ2と同一になるように切断する。

【効果】高信頼性で取り扱い容易な、小型、薄型の半導体装置が得られる。



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【特許請求の範囲】

【請求項１】　半導体チップの側面および下面が露出し、前記半導体チップ上面にこれとほぼ同一の大きさを有する樹脂部が形成され、前記樹脂部の上面から突起電極が突設されていることを特徴とする半導体装置。

【請求項２】　前記樹脂部の最表面の主部に絶縁保護強化膜が形成されていることを特徴とする特許請求項１に記載の半導体装置。

【請求項３】　前記突起電極が埋設された樹脂部を保護強化板としながら半導体ウエハ裏面部を除去させたことを特徴とする特許請求項１に記載の半導体装置の製造方法。

【請求項４】　前記樹脂部から突起電極先端部および半導体ウエハの切断領域を露出させた後に、樹脂部最表面および切断領域表面に絶縁保護強化膜を形成し、切断領域を切断することを特徴とする特許請求項１に記載の半導体装置の製造方法。

【発明の詳細な説明】

【０００１】

【産業上の利用分野】本発明は半導体チップのパッド電極膜上に形成された突起電極先端部を外部接続端子となす半導体装置に関する。

【０００２】

【従来の技術】一般にパターン形成が完了した半導体ウエハは裏面研削法を用いて所定の厚みに研削される。この裏面研削法は、保護フィルムとなる塩化ビニールなどを基材とする軟質性フィルムを半導体ウエハのパターン面に貼り付け、軟質フィルム上から半導体ウエハを均一に加圧して回転させながら、ダイヤモンド粒が樹脂中に練入された粒石により半導体ウエハ裏面を研削、除去するものである。

【０００３】そして研削された半導体ウエハのスクライブラインを切断して個々の半導体チップに分割し、半導体チップと外部端子リードとをボンディングワイヤあるいはＴＡＢリードなどを介して相互に電気的に接合させ、樹脂封止後に外部端子リードを加工形成させるというものが一般的な技術であった。

【０００４】また、半導体ウエハ上にＡｕバンプなどの突起電極を形成させるには、前記裏面研削法による半導体ウエハ裏面を研削し、除去する前もしくは後に、Ｃｒなどのバリア金属膜を形成して、Ａｕ電解メッキ法によりＡｕバンプを選択的に形成させていた。

【０００５】

【発明が解決しようとする課題】半導体装置は、コンピュータ、ワークステーション、パーソナルコンピュータ、ワードプロセッサ、携帯電話、小型携帯カムコーダなどのあらゆる機器に多量に搭載されている。近年、これらの機器の小型化、軽量化の進展は著しく、また、今後これらの機器の小型化、軽量化そして高性能化、高機能化はさらに進むことから、これらの機器に搭載される

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半導体装置の小型化、薄形化、高信頼性化への要求は、半導体素子の高集積化、高機能化という要求と合わせて加速度的に増大していくものと予測される。しかしながら、半導体ウエハの大口径化の進展にともない従来の裏面研削法による半導体ウエハ厚の加工には、ハンドリング時もしくは研削時の半導体ウエハの破損防止という制約により厚みを薄くすることに限界が生じ、この結果、半導体装置に収納する半導体チップが厚くなり、半導体装置の薄形化ひいては機器の薄形化を阻害する要因となっている。さらに、半導体ウエハは裏面研削時のＡｕバンプへの荷重集中による半導体ウエハの破損を回避するために、Ａｕバンプの形成を裏面研削後に行っているのが一般的であり、Ａｕバンプを形成した後に裏面研削を行うことは、荷重の局部集中による半導体ウエハの破損を回避することを考慮すると、非常な困難さを伴うおそれがあった。

【０００６】一方、機器内での半導体装置が占める実装面積は、半導体素子の高集積化、高機能化にともない増大する方向にあり、特に、従来の半導体装置の内側はボンディングワイヤ、インナーリードなどの電気的導通経路を必要とし、かつ、半導体装置の外側には接合を得るためのアウターリードを必要とするために本質的に実装面積は大きくなり、さらには、樹脂厚みと半導体チップ厚みからなる実装高さも高くなり、これらのことが半導体装置の小型化、軽量化を阻害し、ひいては、機器の小型化、軽量化を阻害する要因となっていた。

【０００７】さらに、研削後に分割される半導体チップの素子面は外部からのわずかな力により簡単に損傷を受けやすく、組立工程や実装工程における半導体チップのハンドリングや装置条件の設定には細心の注意が必要であった。

【０００８】本発明は、半導体ウエハを裏面研削により薄く加工しても半導体ウエハ破損が生じないようにすることと同時に半導体チップの素子面への損傷が生じないようにすること、そして、２次元的な電気的導通経路を最小にして実装面積を小さくし、かつ、樹脂厚みおよび半導体チップ厚みを最小にして実装高さを小さくすることを目的としている。

【０００９】

【課題を解決するための手段】本発明の半導体装置は、前述のような課題を解決するものであって、その概要を説明すればつぎの通りである。すなわち、外部接続端子となる突起電極を埋設した樹脂部を保護強化板としながら半導体ウエハ裏面部を研削して半導体ウエハを薄くし、この樹脂部から突起電極先端部および半導体ウエハのスクライブラインを露出させた後に樹脂部最表面の主部およびスクライブライン部表面に絶縁保護強化膜を形成してからスクライブラインを切断して半導体装置を構成させ、そして、この半導体装置上部の樹脂部の上面から突設された突起電極が外部接続端子として電気的かつ

機械的接合を得るように構成したものである。

【００１０】

【作用】前述の手段によれば、半導体ウエハを裏面研削により薄く加工しても半導体ウエハ上に形成された樹脂部が保護強化板として機能するために、裏面研削中およびハンドリング時の半導体ウエハ破損を回避できると同時に、組立工程や実装工程におけるベア状態での半導体チップのハンドリングはなくなり、半導体チップの素子面への損傷も回避できる。また、半導体装置上部の樹脂部の大きさと半導体チップの大きさをほぼ同一となるようにし、前記半導体装置の上部に形成された樹脂部の上面から外部接続端子となる突起電極を突設することにより、容易に２次元的な電気的導通経路を最小にし、かつ、樹脂厚みおよび半導体チップ厚みを薄くさせた小型、薄型の半導体装置を形成することができる。

【００１１】

【実施例】本発明の第１の実施例を図１および図２にもとづいて説明する。図１は本発明の第１の実施例の半導体装置を示す斜視図であり、図２は第１の実施例の半導体装置の製造方法について説明する断面図である。図１は表面に樹脂膜３および突起電極５を形成した半導体ウエハ１を個々の半導体チップ２の大きさに切断した状態を示しており、切断前において表面に樹脂膜３を形成した状態で半導体ウエハ１の裏面を裏面研削法を用いて鏡面状に研削を行って、半導体ウエハ１の厚みを薄く加工した後、スクライブライン４をダイシングブレードを用いて切断している。この半導体ウエハ１の裏面の研削は、裏面研削前に半導体ウエハ１の表面に樹脂膜３を形成させることにより、樹脂膜３を保護強化板として機能させ、６インチ径の半導体ウエハ１であればウエハプロセス加工時の厚みが約０．６mmのものが裏面研削法により０．３５mm～０．４mm程度まで半導体ウエハ１の厚みを薄く加工でき、８インチ径の半導体ウエハ１であってもウエハプロセス加工時の厚みが０．７mm程度のものが同様に０．４mm～０．５mm程度まで半導体ウエハ１の厚みを薄く加工できる。このことにより、半導体ウエハ１の厚み、すなわち、半導体ウエハ１の大きさ如何に関わらず半導体ウエハ１の厚みを薄く加工するとができる。ここで、この樹脂膜３を形成する樹脂材料には、例えば低応力、高耐熱性を有するポリイミド樹脂を用いており、樹脂部の形成方法には一般によく用いられているポリイミド樹脂をスピンコーティングした後に熱硬化させる方法を用いている。また所定の樹脂膜厚を得るためには、スピンコーティングを繰り返すことにより容易に得られる。なお、半導体ウエハ１の表面に形成される樹脂膜３の樹脂材料としては、前述のようなポリイミド樹脂の代わりに、低応力、低収縮性を有するエポキシ系の樹脂を用いることも可能であり、所定の樹脂膜３の厚みはスキージ印刷法を用いることにより容易に得ることができ、この結果、樹脂膜３の保護強化板としての機能はさらに向上することになる。

【００１２】本発明の第１の実施例の半導体装置の製造方法を図２にもとづいて説明する。まず、第１の工程では図２Ａに示すように、パターンが形成された０．６mm程度の厚みを有する半導体ウエハ１の電極パッド上に、クロム薄膜を介して電解メッキ法により選択的にＡｕメッキを施し、円柱状の突起電極５を約１００μmの高さで形成する。つぎに、第２の工程では図２Ｂに示すように、半導体ウエハ１上に突起電極５の上端部を覆う程度の厚みで樹脂膜３を形成する。そして、第３の工程では図２Ｃに示すように、この樹脂膜３を保護強化板および接着剤として半導体ウエハ１の裏面を裏面研削法により研削し半導体ウエハ１の厚みを０．４mm程度となるように薄く加工する。第４の工程では図２Ｄに示すように、半導体ウエハ１の上部に設けられた樹脂膜３の上面を軽くエッチングし、突起電極５の上端部を露出させる。　第５の工程では図２Ｅに示すように、ダイシングブレードにてスクライブライン４の樹脂膜３を削り取り、高温乾燥後、プラズマＣＶＤ法によりシリコンナイトライド膜６を突起電極５の上端部を除いて選択的に形成させる。最後に、第６の工程では図２Ｆに示すように、ダイシング用粘着性テープ（図示せず）にこの半導体ウエハ１を貼り、スクライブライン４で半導体ウエハ１を完全にダイシングブレードにて削りとり、１個１個の半導体チップ２に分離する。なお、スクライブライン４の樹脂膜３を取り除くためには、第５の工程で説明したような物理的な方法だけではなく、化学的エッチングによる方法も可能である。一方、シリコンナイトライド膜６の形成は、絶縁強化保護としての機能は若干低下するが、樹脂膜３の軽いエッチング直後に行うことも可能である。

【００１３】さらに、図１において前述のように個々の半導体チップ２の大きさに切り出された半導体装置は、既に説明した通り裏面研削を施されて薄くなった半導体チップ２の上面に樹脂膜３が形成されており、この樹脂膜３の上面からは半導体チップ２のパッド電極に対して垂直に形成された円柱状の突起電極５の先端部が突出しており、その突起電極５は電解メッキ法を用いて形成されたＡｕ電極であり、その高さは８０μm～１００μmである。ただし、この突起電極５の形状は、円柱状であっても良いし、角柱状であっても良い。一方、この突起電極５の突出量は、突起電極５の高さ、樹脂膜３の厚み、そして、接合安定性から決定され、第１の実施例では２０μm程度を突出させている。また、第１の実施例では、半導体チップ２の側面がダイシングされた状態で露出しており、同様にその裏面が研削された状態で露出している。さらに、図１では特に図示してはいないが、これら半導体チップ２の側面、裏面および突起電極５表面を除いた樹脂膜３最表面には半導体装置としての信頼性を高めるためのシリコンナイトライド膜６がプラズマ

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ＣＶＤ法により２００℃～２５０℃の比較的低温で１μｍ程度形成され、樹脂膜３への水分吸湿による半導体装置の信頼性低下を防ぐ絶縁強化保護膜としている。

【００１４】本発明の第１の実施例の半導体装置を種々の実装形態に適合できることを示すプリント配線板への接合方法を図３にもとづいて説明する。図３は、図１に示した本発明の第１の実施例の半導体装置のプリント配線板への接合方法を示す断面図である。図３Ａにしめすように、フットパターン８が形成されたプリント配線板７へ半導体装置が直接フェイスダウンボンディングされており、フットパターン８上に予め設けられたＡｕバンプ９と半導体チップ２の突起電極５が熱圧着により合金接合されている。またこの合金接合部を含めた半導体装置の信頼性を高めるために、半導体装置の周縁部をエポキシ系の封止樹脂１０をポッティング法で封止している。図３Ｂに示すように、図３Ａに示した半導体装置の裏面に高熱伝導性のシリコン系接着剤１１を塗布し、放熱板１２となるＡｌ合金板を貼付け、半導体装置からの放熱性を積極的に向上させている。図３Ｃは、半導体装置に形成された突起電極５のピッチが微細な場合についての実施例であり、通常のテープキャリア方式のＴＡＢテープと半導体チップ２との接合方法と全く同一な方法で、第１の実施例の半導体装置とＴＡＢテープ１３とを突起電極５を介して接合させ、そして、このＴＡＢテープ１３のリードの終端部とプリント配線板７上のフットパターン８とを半田接合法を用いて接合させ、この半田接合部を含む半導体装置の周縁部を図３Ａ，図３Ｂと同様にエポキシ系の封止樹脂１０でポッティング法により封止させた例である。図３Ｄは、図３Ｃで説明した半導体装置裏面に高熱伝導性のシリコン系接着剤１１を塗布し、放熱板１２となるＡｌ合金板を貼り付け、半導体装置からの放熱性を向上させている。

【００１５】次に、本発明の第２の実施例を図４にもとづいて説明する。図４Ａは、本発明の第２の実施例の半導体装置を示す斜視図であり、図４Ｂは図４Ａの側面図を示している。図４Ａ、図４Ｂに示すように、裏面研削により薄く加工された半導体チップ２上に２つの異なる高さを有した突起電極５が千鳥状に半導体チップ２の周囲に形成されている。そして、半導体チップ２の内側に形成された突起電極５の配列には高い突起電極５が、その外側に形成された突起電極５の配列には低い突起電極５が形成され、突出量が２０μｍ前後となるように樹脂膜３が段状に形成されている。このように半導体装置を構成したことにより、半導体チップ２上の突起電極５が微細ピッチとなっても、隣接リード間のショートが生じにくいＴＡＢボンディングが容易に行えるようになる。

【００１６】つぎに本発明の第３の実施例および第４の実施例を、図５および図６にもとづいて説明する。図５および図６は、それぞれ第３の実施例および第４の実施例の半導体装置を示す斜視図である。図５に示す第３の

6

実施例は、半導体装置に突出させた突起電極５の周囲部の樹脂膜３に凹部１４を形成させてあり、この凹部１４を、図３Ａに示す突起電極５とフットパターン８との接合材料にＡｕバンプ９の代わりに半田を用いたときに、隣接した突起電極５間での半田ブリッジによるショートを防ぐための半田だまりの役目を持たせている。一方、図６に示す第４の実施例は、半導体装置に突設させた突起電極５の上端部と円柱側部のうちの外側部を露出させた例であり、プリント配線板７に凹状の半導体装置収納部（図示せず）と前記半導体装置収納部の側面に縦状の導体パターン（図示せず）と底面に導体パターンを連続して設け、第４の実施例に示した半導体装置をプリント配線板７の半導体装置収納部に収納し、半導体装置の突起電極５の上端部と円柱側部とを前記導体パターンとを半田接合させるようにして半田接合時の信頼性向上をはかると同時に、プリント配線板７への実装時の高さの低減をはかっている。

【００１７】以上説明してきたように、本発明の半導体装置は半導体チップ２の表面に樹脂膜３を形成することにより、半導体ウエハ１の破損、半導体チップ２の素子面の損傷を生じないようにすることができる。また、プリント配線板７への実装時の２次元的な電気導通経路を最小にすると同時に実装高さを小さくすることができる。

【００１８】

【発明の効果】本発明により得られる効果は、半導体ウエハを裏面研削により薄く加工しても半導体ウエハ上に形成された樹脂部が保護強化板として機能することにより裏面研削中およびハンドリング時の半導体ウエハ破損は回避できるようになったと同時に、組立工程や実装工程におけるベア状態の半導体チップのハンドリングがなくなり半導体チップの素子面への損傷も回避できるようになった。また、半導体装置上部の樹脂部の大きさと半導体チップの大きさをほぼ同一となるようにし、前記半導体装置上部の樹脂部の上面から外部接続端子となる突起電極を突設することにより、容易に、２次元的な電気的導通経路が最小で、かつ、樹脂厚みおよび半導体チップ厚みを薄くさせた高信頼性で小型かつ薄形の半導体装置を形成できるようになった。

【図面の簡単な説明】

【図１】本発明の第１の実施例の半導体装置を示す斜視図。

【図２】本発明の第１の実施例の半導体装置の製造方法について説明する断面図。

【図３】本発明の第１の実施例の半導体装置のプリント配線板への接合方法を示す断面図。

【図４】本発明の第２の実施例の半導体装置を示す斜視図および断面図。

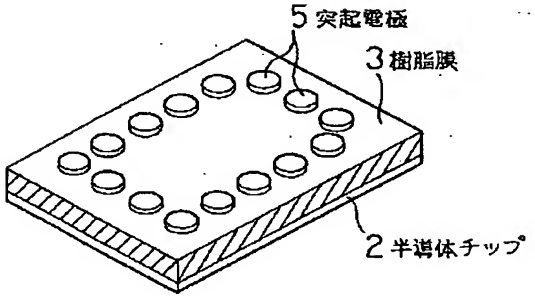
【図５】本発明の第３の実施例の半導体装置を示す斜視図。

【図６】本発明の第４の実施例の半導体装置を示す斜視図である。

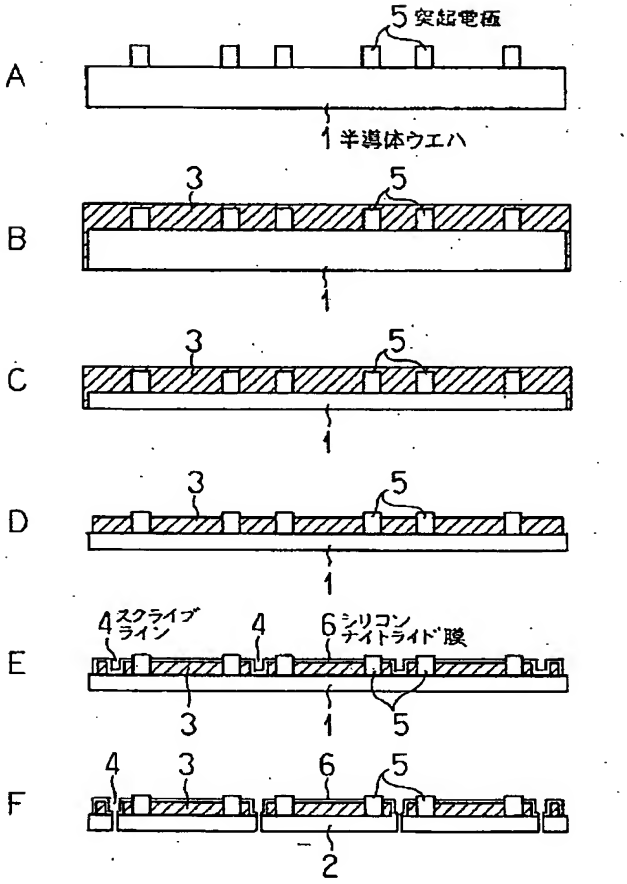
【符号の説明】

1　半導体ウエハ
2　半導体チップ
3　ポリイミド樹脂膜
4　スクライブライン
5　突起電極
6　シリコンナイトライド膜
7　プリント配線板
8　フットパターン
9　Ａｕバンプ
１０　封止樹脂
１１　シリコン系接着剤
１２　放熱板
１３　ＴＡＢテープ

【図１】



【図２】



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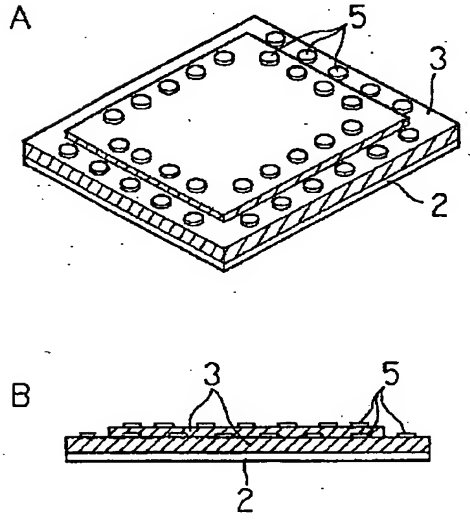

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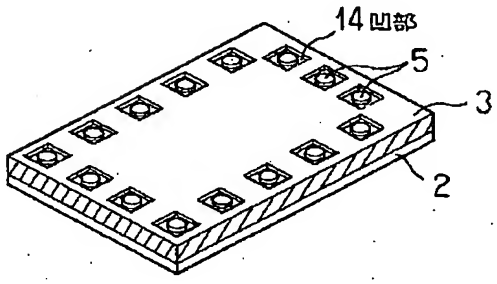

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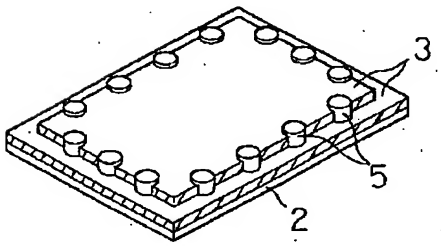
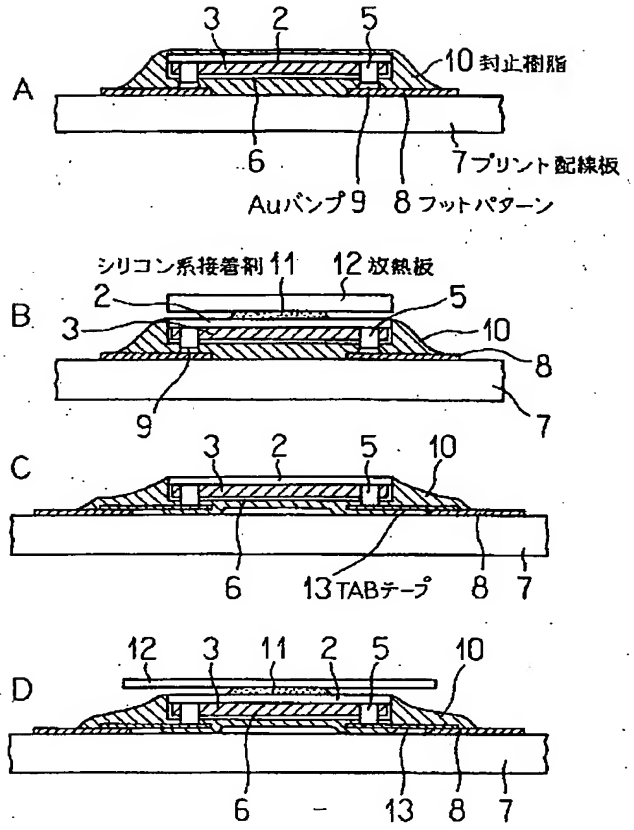


【図３】



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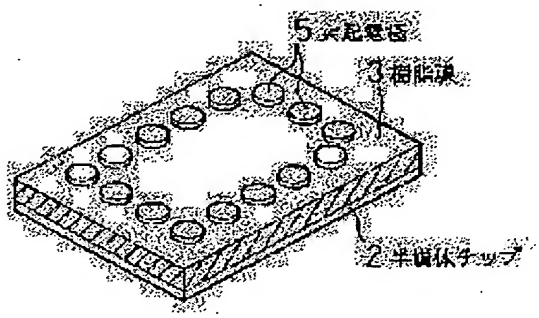
(54) SEMICONDUCTOR DEVICE

(57)Abstract:
PURPOSE: To improve handling operability of a semiconductor chip in a manufacturing step while reducing in thickness of the chip itself irrespective of the size of a semiconductor wafer and to obtain a small-sized thin semiconductor device.
CONSTITUTION: A semiconductor wafer 1 is reduced in thickness while forming a resin film 3 in a protective reinforcing plate, protrusion electrodes 5 protrude from the film 3 on a semiconductor chip 2 as an external connection terminal, and the film 3 is so cut as to be the same in size as the chip 2. Thus, a semiconductor device having high reliability, easy handling, small size and thickness, is obtained.



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CLAIMS

Claim(s)]
Claim 1] The semiconductor device characterized by the side face and inferior surface of tongue of a semiconductor chip being exposed, the resin section which has the almost same magnitude as this being formed n said semiconductor chip top face, and the projection electrode protruding from the top face of said resin section.
Claim 2] A semiconductor device given in the application-for-patent term 1 characterized by forming the nsulation protection strengthening film in the principal piece of the outermost surface of said resin section.
Claim 3] The manufacture approach of a semiconductor device given in the application-for-patent term 1 characterized by making the semi-conductor wafer rear-face section remove, using as a protection strengthening plate the resin section under which said projection electrode was laid.
Claim 4] The manufacture approach of a semiconductor device given in the application-for-patent term 1 characterized by forming the insulation protection strengthening film in the resin section outermost surface and a cutting field front face, and cutting a cutting field after exposing the cutting field of a projection electrode point and a semi-conductor wafer from said resin section.

Translation done.]

)ETAILED DESCRIPTION

Detailed Description of the Invention]
0001]
Industrial Application] This invention relates to the semiconductor device which makes the projection electrode)oint formed on the pad electrode layer of a semiconductor chip with an external connection terminal.
0002]
Description of the Prior Art] Grinding of the semi-conductor wafer which pattern formation generally completed s carried out to predetermined thickness using a rear-face grinding method. This rear-face grinding method is grinding and a thing to remove about a semi-conductor wafer rear face by **** by which ** ON of the diamond grain was carried out into resin, pressurizing homogeneity and rotating [stick on the pattern side of a semi-conductor wafer the elasticity nature film which uses the vinyl chloride used as a protection film etc. as a base material,] a semi-conductor wafer from on an elasticity film.
0003] And the thing of cutting the scribe line of the semi-conductor wafer by which grinding was carried out, having divided into each semiconductor chip, having joined a semiconductor chip and an external terminal lead mutually electrically through a bonding wire or a TAB lead, and carrying out processing formation of the external terminal lead after a resin seal was a general technique.
0004] Moreover, before carrying out grinding of the semi-conductor wafer rear face by said rear-face grinding method and removing it, barrier metal membranes, such as Cr, were formed in behind, and Au bump was made to form in it alternatively with Au electrolysis plating, in order to make projection electrodes, such as Au bump, form on a semi-conductor wafer.
0005]
Problem(s) to be Solved by the Invention] The semiconductor device is carried in all devices, such as a computer, a workstation, a personal computer, a word processor, a cellular phone, and a small pocket camcorder, so much. In recent years, progress of the miniaturization of these devices and lightweight-izing is remarkable, and since the miniaturization of these devices, lightweight-izing and high-performance-izing, and advanced features progress further, the demand to the miniaturization of the semiconductor device carried in these devices, the formation of a thin form, and high-reliability-izing will be predicted to be what increases at an increasing tempo together with a demand called high integration of a semiconductor device, and advanced features from now on. However, with progress of diameter[of macrostomia]-izing of a semi-conductor wafer, the semiconductor chip which a limitation produces to make thickness thin by constraint called breakage prevention of the semi-conductor wafer at the time of handling or grinding, consequently is contained to a semiconductor device becomes thick, and thin form-ized ****** of a semiconductor device has become the factor which checks thin form-ization of a device at processing of the semi-conductor wafer thickness by the conventional rear-face grinding method. Furthermore, as for the semi-conductor wafer, it was common to have formed Au bump after rear-face grinding, in order to avoid breakage of the semi-conductor wafer by the load concentration to Au bump at the time of rear-face grinding, and performing rear-face grinding, after forming Au bump had a possibility that it might be accompanied by extraordinary difficulty, when it took into consideration avoiding breakage of the semi-conductor wafer by local concentration of a load.
[0006] On the other hand, the component-side product which the semiconductor device within a device occupies It tends to increase with high integration of a semiconductor device, and advanced features. Especially The inside of the conventional semiconductor device needs electric flow paths, such as a bonding wire and an inner lead. A component-side product essentially [since the outer lead for acquiring junction is needed for the outside of a semiconductor device] becomes large. And further It had become the factor which the mounting height which consists of resin thickness and semiconductor chip thickness also becomes high, and these things check the miniaturization of a semiconductor device, and lightweight-ization, as a result checks the miniaturization of a device, and lightweight-ization.
[0007] Furthermore, the component side of the semiconductor chip divided after grinding tended to receive damage simply according to few force from the outside, and needed careful cautions for the handling of a semiconductor chip and a setup of equipment conditions in an erector degree or a mounting process.

0008] This invention aims at making to make it the damage to the component side of a semiconductor chip not ırise in making it semi-conductor wafer breakage not arise, even if it processes a semi-conductor wafer thinly by ear-face grinding, and coincidence, and a two-dimensional electric flow path into min, and making a component-ide product small, and making resin thickness and semiconductor chip thickness into min, and making mounting ıeight small.

0009]

Means for Solving the Problem] If the semiconductor device of this invention solves the above technical roblems and the outline is explained, it will be as follows. Namely, using as a protection strengthening plate the esin section which laid the projection electrode used as an external connection terminal underground, carry out grinding of the semi-conductor wafer rear-face section, and a semi-conductor wafer is made thin. After exposing he scribe line of a projection electrode point and a semi-conductor wafer from this resin section and forming he insulation protection strengthening film in the principal piece of the resin section outermost surface, and a scribe line section front face, cut a scribe line and a semiconductor device is made to constitute. It constitutes so that junction electric [the projection electrode which protruded from the top face of the resin section of this semiconductor device upper part] as an external connection terminal, and mechanical may be acquired.

0010]

Function] Even if it processes a semi-conductor wafer thinly by rear-face grinding , in order that the resin section formed on the semi-conductor wafer may function as a protection strengthening plate according to the above-mentioned means , while the semi-conductor wafer breakage at the time among rear-face grinding of handling is avoidable , handling of the semiconductor chip in the raise in basic wages condition in an erector degree or a mounting process is lose , and can also avoid the damage to the component side of a semiconductor chip . moreover , small [which the two-dimensional electric flow path be easily made / small / into min , and made thin resin thickness and semiconductor chip thickness] , and a thin semiconductor device can be form by protrude the projection electrode which the magnitude of the resin section of the semiconductor device upper part and the magnitude of a semiconductor chip be make to become almost the same , and serve as an external connection terminal from the top face of the resin section formed in the upper part of said semiconductor device .

0011]

Example] The 1st example of this invention is explained based on drawing 1 and drawing 2 . Drawing 1 is the perspective view showing the semiconductor device of the 1st example of this invention, and drawing 2 is a sectional view explaining the manufacture approach of the semiconductor device of the 1st example. After drawing 1 shows the condition of having cut the semi-conductor wafer 1 in which the resin film 3 and the projection electrode 5 were formed on the front face, in the magnitude of each semiconductor chip 2, it performs grinding for the rear face of the semi-conductor wafer 1 in the shape of a mirror plane using a rear-face grinding method where the resin film 3 is formed in a front face before cutting, and it processes the thickness of the semi-conductor wafer 1 thinly, it is cutting the scribe line 4 using a dicing blade. The grinding of the rear face of this semi-conductor wafer 1 by making the resin film 3 form on the front face of the semi-conductor wafer 1 before rear-face grinding The resin film 3 is operated as a protection strengthening plate, and that whose thickness at the time of wafer process processing is about 0.6mm if it is the semi-conductor wafer 1 of the diameter of 6 inch can process the thickness of the semi-conductor wafer 1 thinly to 0.35mm - about 0.4mm by the rear-face grinding method. Even if it is the semi-conductor wafer 1 of the diameter of 8 inch, that whose thickness at the time of wafer process processing is about 0.7mm can process the thickness of the semi-conductor wafer 1 thinly to 0.4mm - about 0.5mm similarly. It can **, if it is not concerned in the thickness of the semi-conductor wafer 1, i.e., the size of the semi-conductor wafer 1, how but the thickness of the semi-conductor wafer 1 is thinly processed by this. Here, after carrying out spin coating of the polyimide resin which uses the polyimide resin which has for example, low stress and high thermal resistance for the resin ingredient which forms this resin film 3, and is generally well used for the formation approach of the resin section, the approach of carrying out heat curing is used. Moreover, in order to obtain predetermined resin thickness, it is easily obtained by repeating spin coating. In addition, it will also be possible to use the resin of the epoxy system which has low stress and low shrinkage characteristics instead of the above polyimide resin as a resin ingredient of the resin film 3 formed in the front face of the semi-conductor wafer 1, and the thickness of the predetermined resin film 3 can be easily obtained by using squeegee print processes, consequently the function as a protection strengthening plate of the resin film 3 will improve further.

[0012] The manufacture approach of the semiconductor device of the 1st example of this invention is explained based on drawing 2 . First, in the 1st process, as shown in drawing 2 A, on the electrode pad of the semi-conductor wafer 1 which has the thickness which is about 0.6mm in which the pattern was formed, Au plating is alternatively performed with electrolysis plating through a chromium thin film, and the cylinder-like projection electrode 5 is formed in height of about 100 micrometers. Next, in the 2nd process, as shown in drawing 2 B, the resin film 3 is formed for the upper limit section of the projection electrode 5 by the thickness of wrap extent on the semi-conductor wafer 1. And at the 3rd process, as shown in drawing 2 C, grinding of the rear face of the

semi-conductor wafer 1 is carried out by the rear-face grinding method by using this resin film 3 as a protection strengthening plate and adhesives, and the thickness of the semi-conductor wafer 1 is thinly processed so that it may be set to about 0.4mm. At the 4th process, as shown in drawing 2 D, the top face of the resin film 3 established in the upper part of the semi-conductor wafer 1 is etched lightly, and the upper limit section of the projection electrode 5 is exposed. The resin film 3 of the scribe line 4 is shaved off with a dicing blade, and the silicon nitride film 6 is made to form alternatively except for the upper limit section of the projection electrode 5 after elevated-temperature desiccation by the plasma-CVD method at the 5th process, as shown in drawing 2 E. Finally, at the 6th process, as shown in drawing 2 F, this semi-conductor wafer 1 is stuck on the adhesive tape for dicing (not shown), the semi-conductor wafer 1 is completely shaved off with a dicing blade in the scribe line 4, and it separates into the one-piece one semiconductor chip 2. In addition, in order to remove the resin film 3 of the scribe line 4, not only a physical approach that was explained at the 5th process but the approach by chemical etching is possible. On the other hand, formation of the silicon nitride film 6 can also be carried out immediately after light etching of the resin film 3, although the function as insulating strengthening protection falls a little.

[0013] Furthermore, the semiconductor device cut down by the magnitude of each semiconductor chip 2 as mentioned above in drawing 1 The resin film 3 is formed in the top face of the semiconductor chip 2 which rear-face grinding was given and became thin as already explained. From the top face of this resin film 3, the point of the projection electrode 5 of the shape of a cylinder perpendicularly formed to the pad electrode of a semiconductor chip 2 has projected, that projection electrode 5 is an Au electrode formed using electrolysis plating, and that height is 80 micrometers - 100 micrometers. However, the configuration of this projection electrode 5 may be cylindrical, and may be a prismatic form. On the other hand, the amount of protrusions of this projection electrode 5 is determined from the height of the projection electrode 5, the thickness of the resin film 3, and junction stability, and is making about 20 micrometers project in the 1st example. Moreover, in the 1st example, it has exposed, where the dicing of the side face of a semiconductor chip 2 is carried out, and where grinding of the rear face is carried out similarly, it has exposed. Furthermore, although not illustrated especially in drawing 1 , the silicon nitride film 6 for raising the dependability as a semiconductor device to the resin film 3 outermost surface except the side face of these semiconductor chips 2, a rear face, and projection electrode 5 front face is considering as the insulating strengthening protective coat which prevents the dependability fall of the semiconductor device about 1 micrometer is comparatively formed at low temperature, and according to the moisture moisture absorption to the resin film 3 of 200 degrees C - 250 degrees C by the plasma-CVD method.

[0014] The junction approach to the printed wired board which shows that various mounting gestalten can be suited in the semiconductor device of the 1st example of this invention is explained based on drawing 3 . Drawing 3 is the sectional view showing the junction approach to the printed wired board of the semiconductor device of the 1st example of this invention shown in drawing 1 . Direct face down bonding of the semiconductor device is carried out to the printed wired board 7 in which the foot pattern 8 was formed, and alloy junction of the projection electrode 5 of the Au bump 9 and semiconductor chip 2 which were beforehand prepared on the foot pattern 8 is carried out by thermocompression bonding so that it may be shown in drawing 3 A. Moreover, in order to raise the dependability of a semiconductor device including this alloy junction section, the closure resin 10 of an epoxy system is closed for the periphery section of a semiconductor device by the potting method. As shown in drawing 3 B, the silicon system adhesives 11 of high temperature conductivity are applied to the rear face of the semiconductor device shown in drawing 3 A, aluminum alloy plate used as a heat sink 12 is stuck, and the heat dissipation nature from a semiconductor device is raised positively. Drawing 3 C is the example of an about when the pitch of the projection electrode 5 formed in the semiconductor device is detailed, and it is the completely same approach as the junction approach of the TAB tape of the usual tape career method, and a semiconductor chip 2. The 1st semiconductor device and TAB tape 13 of an example are joined through the projection electrode 5. It is the example to which the closure of the periphery section of the semiconductor device which is made to join the trailer of a lead of this TAB tape 13 and the foot pattern 8 on a printed wired board 7 using the joining method, and contains this soldered joint section was carried out by the potting method by the closure resin 10 of an epoxy system like drawing 3 A and drawing 3 B. Drawing 3 D applies the silicon system adhesives 11 of high temperature conductivity to the semiconductor device rear face explained by drawing 3 C, sticks aluminum alloy plate used as a heat sink 12, and is raising the heat dissipation nature from a semiconductor device.

[0015] Next, the 2nd example of this invention is explained based on drawing 4 . Drawing 4 A is the perspective view showing the semiconductor device of the 2nd example of this invention, and drawing 4 B shows the side elevation of drawing 4 A. As shown in drawing 4 A and drawing 4 B, the projection electrode 5 with two different height is alternately formed around the semiconductor chip 2 on the semiconductor chip 2 thinly processed by rear-face grinding. And the projection electrode 5 with the high projection electrode 5 low in the array of the projection electrode 5 formed in the outside is formed in the array of the projection electrode 5 formed inside the semiconductor chip 2, and the resin film 3 is formed in the shape of a stage so that the amount of protrusions may become 20-micrometer order. Thus, even if the projection electrode 5 on a semiconductor chip

? serves as a detailed pitch by having constituted the semiconductor device, TAB bonding which the short-circuit during a contiguity lead cannot produce easily can be performed easily.

[0016] The 3rd example and 4th example of this invention are explained based on drawing 5 and drawing 6 below. Drawing 5 and drawing 6 are the perspective views showing the semiconductor device of the 3rd example and the 4th example, respectively. the 3rd example shown in drawing 5 be the solder for preventing the short-circuit by the solder bridge between the adjoining projection electrodes 5 , when solder use for the cementing material of the projection electrode 5 and the foot pattern 8 which be made to have formed the crevice 14 in the resin film 3 of the perimeter section of the projection electrode 5 which made the semiconductor device project , and show this crevice 14 to drawing 3 A instead of an Au bump 9 -- the duty of a ball be giving . On the other hand, the 4th example shown in drawing 6 is an example for which the upper limit section of the projection electrode 5 made to protrude on a semiconductor device and the lateral part of the cylinder flanks were exposed. A conductor pattern is continued and prepared in the side face of a concave semiconductor device stowage (not shown) and said semiconductor device stowage on length-like a conductor pattern (not shown) and a base at a printed wired board 7. The semiconductor device shown in the 4th example is contained to the semiconductor device stowage of a printed wired board 7. Reduction of the height at the time of mounting to a printed wired board 7 is aimed at at the same time it aims at the improvement in dependability at the time of a soldered joint, as said conductor pattern is joined with solder for the upper limit section and the cylinder flank of the projection electrode 5 of a semiconductor device.

[0017] The semiconductor device of this invention can be prevented from producing breakage of the semi-conductor wafer 1, and damage on the component side of a semiconductor chip 2 by forming the resin film 3 in the front face of a semiconductor chip 2, as explained above. Moreover, mounting height can be made small while making the two-dimensional electric flow path at the time of mounting to a printed wired board 7 into min.

[0018]

[Effect of the Invention] Even if the effectiveness acquired by this invention processed the semi-conductor wafer thinly by rear face grinding , when the resin section formed on the semi-conductor wafer functioned as a protection strengthening plate , while the semi-conductor wafer breakage at the time among rear face grinding of handling could be avoided , handling of the semiconductor chip of the raise in basic wages condition in an erector degree or a mounting process is lost , and the damage to the component side of a semiconductor chip could also be avoided . moreover , the semiconductor device of small and a thin form can be form now with the high-reliability which a two-dimensional electric flow path be [high-reliability] min , and made thin easily resin thickness and semiconductor chip thickness by protrude the projection electrode which the magnitude of the resin section of the semiconductor device upper part and the magnitude of a semiconductor chip be make to become almost the same , and serve as an external connection terminal from the top face of the resin section of said semiconductor device upper part .

[Translation done.]

)ESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] The perspective view showing the semiconductor device of the 1st example of this invention.
[Drawing 2] The sectional view explaining the manufacture approach of the semiconductor device of the 1st example of this invention.
[Drawing 3] The sectional view showing the junction approach to the printed wired board of the semiconductor device of the 1st example of this invention.
[Drawing 4] The perspective view and sectional view showing the semiconductor device of the 2nd example of this invention.
[Drawing 5] The perspective view showing the semiconductor device of the 3rd example of this invention.
[Drawing 6] It is the perspective view showing the semiconductor device of the 4th example of this invention.
[Description of Notations]
1 Semi-conductor Wafer
2 Semiconductor Chip
3 Polyimide Resin Film
4 Scribe Line
5 Projection Electrode
6 Silicon Nitride Film
7 Printed Wired Board
8 Foot Pattern
9 Au Bump
10 Closure Resin
11 Silicon System Adhesives
12 Heat Sink
13 TAB Tape

[Translation done.]